

UHD  
Streaming

5G

6 GHz

AR  
VR



# Entire 6 GHz Band Critical for Wireless Broadband

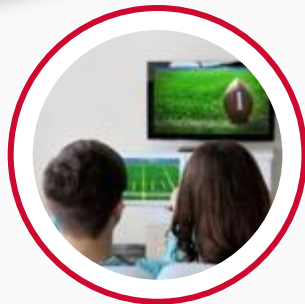
Christopher Szymanski  
Director, Product Marketing | Technology Strategy

March 23, 2023



# Broadband Investments based on Backhaul + **Wireless**

## Connected Devices



Wi-Fi

## Customer Premise

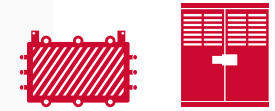


DSL CPE



PON CPE (ONU/GW)

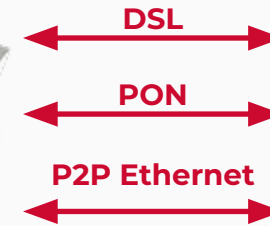
## Service Provider



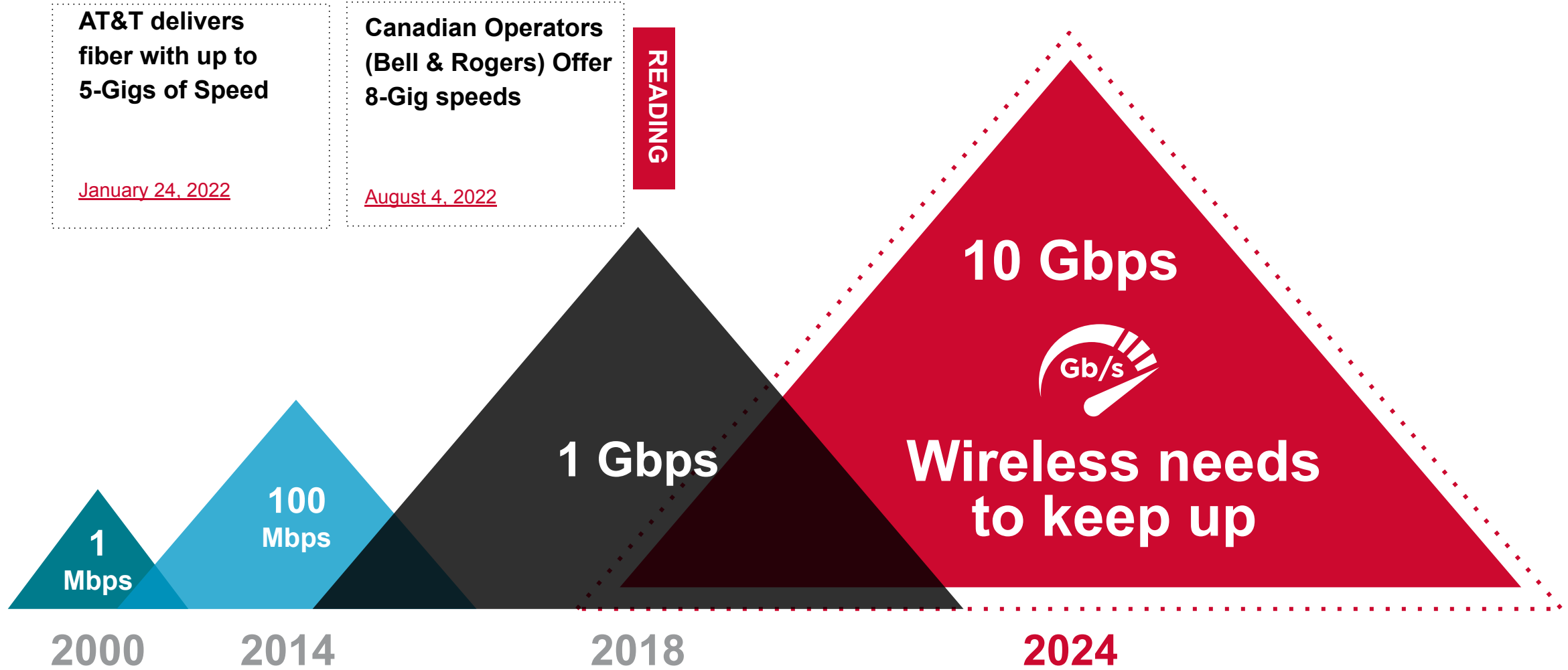
DSLAM



PON OLT

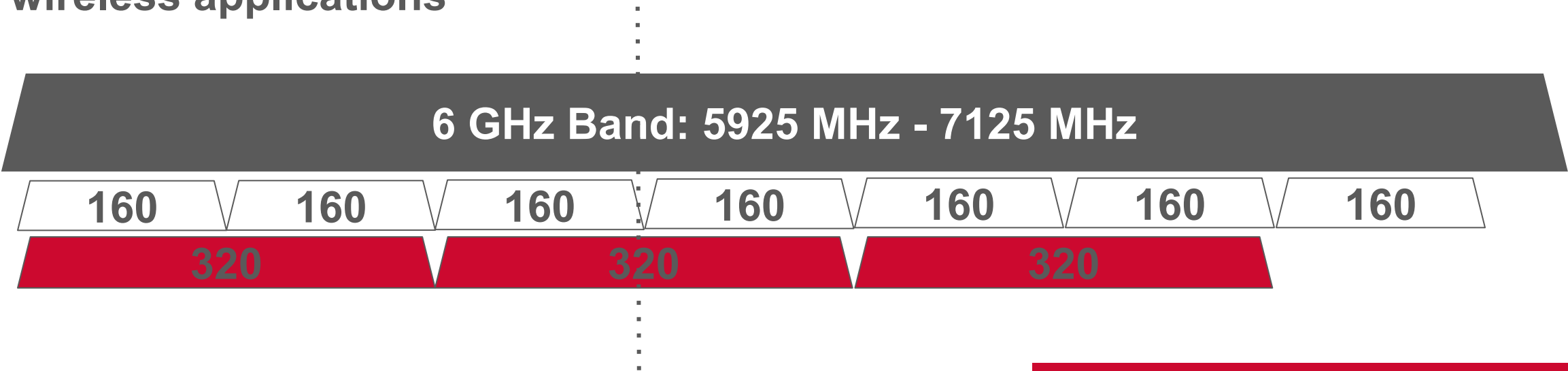


# Broadband Trends



# 6 GHz Wi-Fi *Perfect* Complement to Broadband

6 GHz Wi-Fi is specially designed for gigabit broadband and immersive wireless applications



- Three non-overlapping 320 MHz channels
- Seven non-overlapping 160 MHz channels
- Fourteen non-overlapping 80 MHz channels

**Countries that only enable 500 MHz will have degraded performance for their citizens and industry**

# Wi-Fi 6E devices operating in their widest capable bandwidth are the most power efficient and capable of operating at the lowest latency

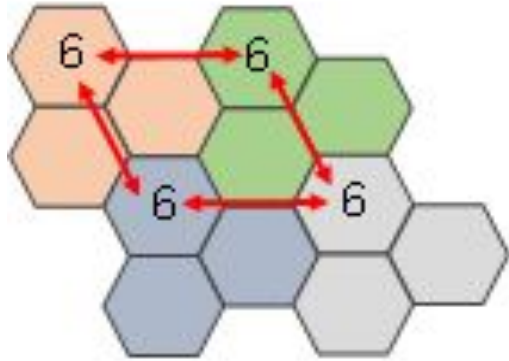


Meta says Quest Pro includes a full Wi-Fi 6E experience in the 6 GHz broadband spectrum, and can **deliver up to 1.6Gbps of throughput**, which is notably double the bandwidth over Quest 2 Wi-Fi capabilities.



The new iPad Pro supports the fastest Wi-Fi connections with support for Wi-Fi 6E, so users who need fast connections can take their demanding workflows with them everywhere. **Downloads are up to 2.4Gb/s, 2x faster than the previous generation.**

# Markets that only designate 500 MHz will have insufficient capacity to deliver gigabit+ broadband wirelessly



With three channels, there is typically enough spatial separation between each residential network where the amount of same channel interference is limited

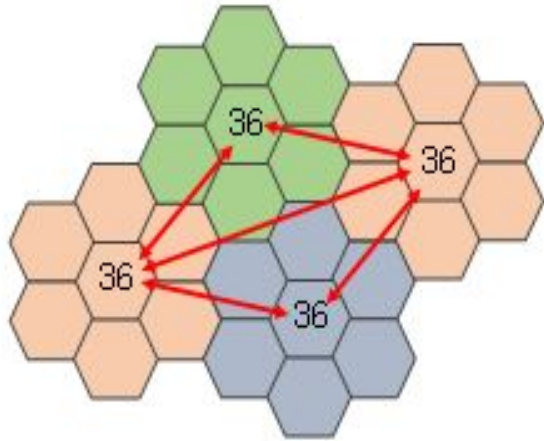
- In dense urban corridors 4 or even 5 channels could be required to avoid significant overlapping networks on same channel

| Spectrum Availability | Bandwidth       | Client Capability | Client Capability |
|-----------------------|-----------------|-------------------|-------------------|
|                       |                 | 1 Spatial Stream  | 2 Spatial Streams |
| 1200 MHz              | Maximum 320 MHz | 2.5 Gb/s          | 5 Gb/s            |
| 500 MHz (480 MHz)     | Maximum 160 MHz | 1.2 Gb/s          | 2.4 Gb/s          |

- French Operators announcing 2 Gb/s
- US Operators announcing 5 Gb/s
- Canadian Operators announcing 8 Gb/s

\*Note: Client devices typically have only one or two antennas, which will limit the overall capability of the network

# Markets that only designate 500 MHz will have ¼ of the capacity for typical carpeted enterprise



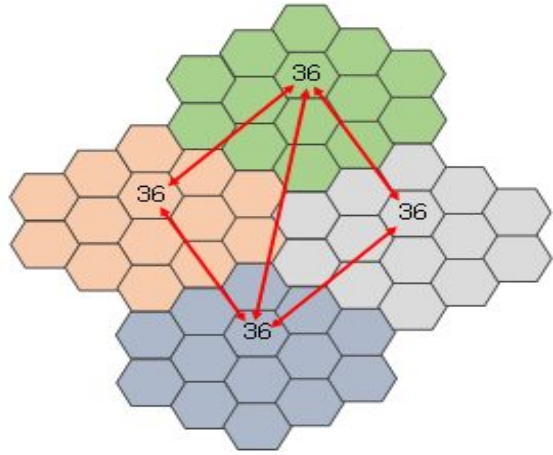
Typical carpeted enterprise configurations require a minimum of seven channels to avoid co-channel interference

- With 1200 MHz you can enable 160 MHz channels
- With 500 MHz you can only enable 40 MHz channel

| Spectrum Availability | Bandwidth       | 1SS      | 2SS      |
|-----------------------|-----------------|----------|----------|
| 1200 MHz              | Maximum 160 MHz | 1.2 Gb/s | 2.4 Gb/s |
| 500 MHz (480 MHz)     | Maximum 40 MHz  | 286 Mb/s | 573 Mb/s |

- This will create asymmetric communications capabilities for industries that are located in countries that have opened up the entire 6 GHz band
  - Note, enterprise is rapidly adopting Wi-Fi 6E, so these asymmetries are playing out in the market right now
  - This will significantly impact research institutions, schools, hospitals

# Markets that only designate 500 MHz will have 1/4 of the capacity for dense stadium deployments



Typical stadium deployment requires a minimum of 14 channels to avoid co-channel interference

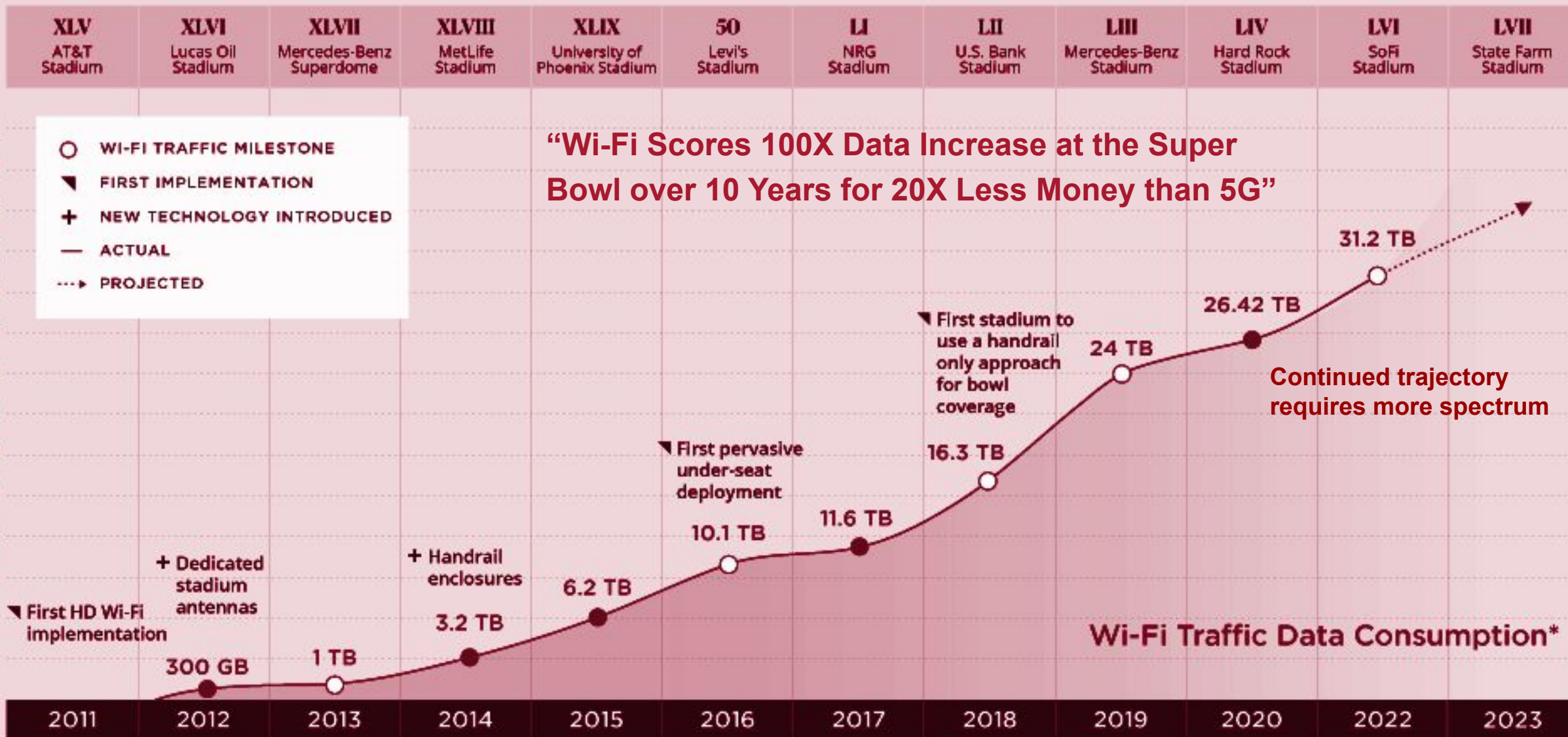
- With 1200 MHz you can enable 80 MHz channels
- With 500 MHz you can only enable 20 MHz channel

| Spectrum Availability | Bandwidth      | 1SS      | 2SS      |
|-----------------------|----------------|----------|----------|
| 1200 MHz              | Maximum 80 MHz | 600 Mb/s | 1.2 Gb/s |
| 500 MHz (480 MHz)     | Maximum 20 MHz | 143 Mb/s | 286 Mb/s |

- Events in venues that are located in countries that do not designate the whole band will have serious competitive disadvantage in providing next generation fan experiences



# SUPER BOWL HIGH-DENSITY WI-FI



**“Wi-Fi Scores 100X Data Increase at the Super Bowl over 10 Years for 20X Less Money than 5G”**

**Continued trajectory requires more spectrum**

**Wi-Fi Traffic Data Consumption\***

\* Super Bowl Wi-Fi data compiled by Extreme Networks

Super Bowl LV at Raymond James Stadium in 2021 saw 13.97 TB of Wi-Fi used with reduced attendance due to Covid pandemic

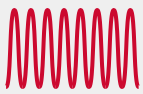
# Why the full 6 GHz band?



Equipment on the market is already designed to operate **over the entire band**



Enterprises and dense urban environments **require more channels** to work effectively



Citizens in countries that have **allocated the full band** will have a superior wireless broadband experience



This will realize benefit of **broadband investment**



Alternatives are **speculative**



# Select Announcements



# Wi-Fi 6E enables research collaboration at the University of Michigan



***Ravi Pendse***  
***Chief Information Officer***

“ The **more than 16,000 Wi-Fi 6E wireless access points** make it easier for researchers...to **collaborate with peers** across campus, moving around and analyzing **large amounts of data**.

We want to...build a transformational network that allows our researchers to do the work they need to do, to move the information at the **highest possible speeds** that they can, to provide to them **ubiquitous bandwidth**. ”

# Wi-Fi 6E enables next generation healthcare and services

“ Wi-Fi 6E brings 1200 MHz of interference-free spectrum that will **enable advanced healthcare deployment scenarios**.

Our mission-critical, Wi-Fi-enabled care equipment will now have its **own clean airspace** to ensure the delivery of revolutionary new services.

This opens the door.. to dream big when it comes to the **innovation in mobile care**.

**Wi-Fi 6E is the catalyst** that will enable our vision of next-generation healthcare and patient experiences. ”

The logo for Novant Health, featuring a large purple 'N' on the left, followed by two small purple squares, and the words 'NOVANT' and 'HEALTH' stacked in a grey, sans-serif font to the right.

**NOVANT**  
**HEALTH**

***Allen Rider***  
***Chief Wireless Network Architect***

# Wi-Fi 6E\* enables proliferation of digital services and operational efficiencies for stadiums

**LIVERPOOL F.C. TO DRIVE EXCEPTIONAL FAN EXPERIENCES WITH WI-FI 6E AND ANALYTICS**

**DREW CRISP**  
SVP of Digital,  
Liverpool Football Club

**NORMAN RICE**  
Chief Operating Officer,  
Extreme Networks

**Extreme networks**  
OFFICIAL WI-FI SOLUTIONS PARTNER OF LIVERPOOL FOOTBALL CLUB

With Extreme Networks' Wi-Fi 6E and analytics, Liverpool FC will gain **real-time data** to Anfield Stadium, which houses 54,000 fans.

These insights will empower the club to make data-driven decisions, **deliver more personalised fan experiences** and **improve operational efficiencies** on match day.

\* Outdoor is not authorized in UK, so outdoor is 5 GHz Wi-Fi 6; and indoor deployments can be Wi-Fi 6E

# Golden State Warriors and Chase Center Elevate Immersive Fan Experiences with Aruba Wi-Fi 6E



“The Warriors are **obsessed with creating world class experiences, and providing fast, reliable connectivity for sold out crowds of 18,000+ fans** at games and events at Chase Center is an incredibly important part of that,” said Warriors President and Chief Operating Officer, Brandon Schneider.

“With the addition of **Wi-Fi 6E Access Points** in the arena bowl, we **can provide fans a more immersive experience** that we believe is unmatched by any other professional sporting venue.”

# Wi-Fi 6E enables innovation in carpeted enterprise

**LG Electronics** tapped **Extreme Networks** to upgrade its **end-to-end network** at LG's **headquarters** in the Republic of Korea.

With **next generation Wi-Fi 6E** and easy-to-deploy Fabric and Universal switching solutions, LG unlocked:

- **Next-generation connectivity** for all employees and users
- A **Future-proofed network** for further upgrades and expansions







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